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ABSTRACT

The purpose of this guide is to inform students of solid waste problems and disposal options. Lesson plans deal specifically with waste and recycling and include interdisciplinary approaches to these problems. The manual is divided in two sections - K-6 and 7-12. Activities are designed to allow the teacher maximum flexibility, and plans may be modified easily. A state-by-state list of solid waste agencies is provided. (Author/RE)

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Office of Water &
Waste Management
Washington DC 20460

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Solid Waste

EPA

Let's Recycle!

Lesson Plans for Grades K-6 and 7-12

FACTS AND FIGURES

MUNICIPAL* SOLID WASTE IN THE UNITED STATES, 1976

Volume:	130 million metric tons
Collection and disposal costs:	$4 billion
Personnel involved:	227,000
Disposal sites:	18,500 covering 500,000 acres

*Does not include industrial, wastewater treatment, agricultural, and mining wastes, which raise the total volume of solid waste to about 6 billion tons each year.

Let's Recycle!

Lesson Plans for Grades K-6 and 7-12

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U.S. Environmental Protection Agency 1980

Foreword

In December 1975, the U.S. Environmental Protection Agency gave financial and technical assistance to a demonstration project in the city of Somerville, Massachusetts, to determine the feasibility of separating out recyclable household waste from other waste prior to pick up. The funds were granted on the premise that information on this approach to resource recovery would be of value to other municipalities throughout the nation. This program was the first of its kind and represented an opportunity to establish municipal-scale, low-technology recycling as a viable alternative to disposal.

A major factor in the success of the Somerville program was an aggressive public education campaign to inform residents of the program and the importance of their participation. The school system was used to help spread information to children and, through them, to their parents.

These lesson plans are based upon those which emerged as part of that educational effort (prepared by John Madama, Steppingstones, Inc.). Many of the ideas and activities were originally developed by the Environmental Action Coalition of New York City in a series of teaching packets called "Don't Waste Waste." EPA acknowledges permission for their use and permission by the Atlanta Clean City Commission to reprint the skit "Throwaway Three."

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Let's Recycle!

In the United States today we too often discard items which in earlier times would have been repaired or saved for other uses. In fact, many modern products are designed for a relatively short life followed by a speedy trip to the refuse pile. The refuse from the materials we use daily adds about 140 million metric tons per year to our municipal waste (this does not include the waste generated by the industries producing these materials). This quantity of solid waste may be visualized by imagining the New Orleans Superdome being filled from floor to ceiling, twice each day, every day of the year.

How we dispose of all this waste in an environmentally sound manner is a complex and often controversial issue. Water pollution not only results from direct dumping into the seas, but also from run-off and leaching from dumps and burial sites. Air pollution not only results from open burning, but also from faulty incineration and from gases (caused by decomposition) surfacing in landfills. Fires, explosions, noxious odors, rodents, and disease must be guarded against in all cases. And direct contact with refuse is often hazardous to the public as well as to the waste collectors and processors (who, incidentally, have the highest on-the-job injury rate of any occupation in the nation).

Our disposal options are steadily being reduced. Locating sites for new landfills is getting more difficult due to economic constraints, public concern over health and neighborhood, and new State and Federal requirements imposed to protect health and the environment. Similarly, Federal and State regulations impose strict requirements on incinerator operation and design.

Land disposal will continue to be the major method of solid waste disposal for the near future. It is likely that there will always be some residual portion requiring land disposal no matter how efficient our recovery, treatment, and recycling processes become.

Much of the opposition to landfills has been based on pollution, health, and safety problems. However, these problems can be avoided or controlled by improved siting, design, and operation of disposal facilities. The U.S. Environmental Protection Agency (EPA) has published criteria, under the Resource Conservation and Recovery Act of 1976, for determining if a particular disposal site is environmentally acceptable. Sites which do not satisfy the criteria will be classed as "open dumps." All open dumps must either be closed, or upgraded to acceptable standards, by September 1985.

By the same date, municipal solid waste collection and disposal costs will increase to around $50 per ton, or $7.5 billion annually. Longer hauling distances from metropolitan areas to landfill sites and more stringent environmental regulations push this cost upwards, as do general increases in labor costs and rising land values.

One of the chief ways to lessen our waste disposal problems is to reuse many of the things we have habitually thrown out. If we carefully consider all purchases, we can reduce the number of items eventually thrown away and also conserve our dwindling resources.

Some of our trash has economic value. It can be sold or reprocessed to be used again to make new products. Or it can be burned to produce useful electrical and other forms of energy. This will also reduce our reliance on foreign oil supplies for fuel. Moreover, the recovery of materials reduces waste and pollution and also conserves our limited natural resources and energy.

It is becoming increasingly important to make the public aware of the hidden "garbage crisis," which threatens to engulf our cities, and our natural resource base as well. The school system is an invaluable tool for increasing public awareness of this problem. Teachers are in an excellent position to enlighten our younger citizens concerning how solid waste problems relate to them, and how they can contribute to a solution.

How to use these lesson plans

The purpose of this guide is to inform students of solid waste problems and the options to disposal. The activities were designed to help students better understand the world around them, a world that faces many health and environmental problems caused by lack of adequate pollution controls to protect the air, water, and land. We hope that these activities will stimulate the students to reassess some of our present values and habits in light of their impacts upon our environment.

The lesson plans deal specifically with waste and recycling, but in so doing encompass such broad areas as social and economic issues, natural resources, and a variety of pollution problems. The manual is divided into two sections: one for grades kindergarten through 6, and one for grades 7 through 12. The activities have been designed to give the teacher maximum flexibility--activities may easily be eliminated, or modified, as class needs predict. The teacher's most important role is to generate enthusiasm, which is best accomplished with student activities. Projects for all students should be encouraged, and the teacher's role as a lecturer minimized. Projects should be designed so that the student's personal involvement will carry over into a continuing consciousness for conservation in the home.

Develop a Fact Sheet

You or your class may want to find the answers to the following questions in order to make these lessons relate directly to your community.

1. What is the population of your community? How many families?

2. How many tons of garbage does your community dispose of each day? (This information may be obtained from the Department of Public Works or the Department of Sanitation.)

3. How many pounds are disposed of per person per day? Per year? (The national average is 3.5 pounds per day, or 1,300 pounds per year per person, but each community is different.)

4. How much does it cost to dispose of the waste per ton? (The average cost to landfill in 1976 was $30 per ton.) How much does this cost your community every day? Every year?

5. How is garbage disposed of in your community? Is it burned, buried, dumped? Is any of it subject to resource recovery processes, for example, separate collection of newspapers, cans, and bottles?

6. Is there a recycling program in your town? Is it run by the city or by private citizens?

An article describing the results of this survey might be prepared for publication in the school or local newspaper.

Grades K-6

Topic One—What Is Waste?

Waste is material that is no longer used or needed

Vocabulary: waste, dump, burn, garbage, wastebasket.

To lead into this activity:

Q- Who knows what waste or garbage is?

Q- What are some other names we have for waste?

Q- Where do we put our classroom waste?

To follow up:

Q- What happens to our waste when it leaves the school?

Q- What happens to our waste when it leaves our home?

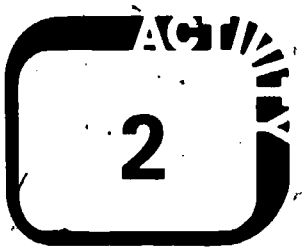
Q- What kinds of waste do we throw away at home? (Write them on the blackboard.)

Q- Where does it go?

Q- Has anyone ever seen a big dump or a place where garbage is burned?

An activity to follow the above would be to have the children draw their impressions of a dump. Another possibility would be to make a montage of pictures of products from a magazine jumbled together like in a dump. The students could go on a field trip to a sanitary landfill, and draw or write their reactions to the site.

There are many different types of waste



Vocabulary: metal, glass, plastic.

The teacher or students should bring in as many clean and different examples of waste as possible. Include plastic, newspaper, cardboard, stationery, different types of cans and glass.

Have the children sort the waste into categories such as all paper waste, metal, glass, plastic. They should manipulate it as much as possible to feel the different textures and shapes.

Have the children see which objects are attracted to a magnet.

Play a game whereby objects are placed in a paper bag and the children use only their sense of touch to determine if it is glass, metal, plastic, or paper.

Have the children trace outlines of the objects and make pictures of them to color. What are their shapes?

Topic Two—Where Does Waste Go?

Clean air, water, and land are necessary for our happiness and survival

Activity 3

Vocabulary: air, water, soil.

To illustrate these media and their importance to us you will need: a balloon (have one of the children blow it up), a glass of water, and a potted plant.

Let the air out of the balloon allowing the children to feel the air on their hands. Make sure they understand that this is air that was in the balloon.

Q- Why do we need air?

Have them take a deep breath to understand that without clean air we could not live. Discuss with them the wind, airplanes, whistles, fans--these all illustrate air and its movements. They can make a fan out of folded paper.

Show them the water.

Q- Why do we need water?

Have them relate their experience with water.

Show them the potted plant.

Q- What grows in the soil?
Q- Does anyone have a garden?
Q- If we had no soil could we have any food?

Waste is disposed of in the air, water, and land

Activity 4

Q- How many have ever seen pollution? What kind?
Q- Why is pollution bad for us?
Q- What is the worst type of pollution? Have the children vote. The contestants are: Smoke, dirty water, litter, and open dumps.
Q- Why are these bad for us? (Smoke burns our eyes; litter is ugly.)
Q- How does our waste pollute? This question should tie together and reinforce the understanding that waste pollutes by smoke, dirty water, litter, and open dumps.

ACTIVITY 5

Have the children look for signs of pollution on the way to and from school. This activity is especially good for litter hunts with the teacher. The children can count the number of different types of litter.

Q- What is the most common type?
Q- Where is the most litter found?
Q- What is a litterbug?

This activity gives the option of having the children clean up the litter around the school.

ACTIVITY 6

What happens at the dump?

The teacher should take a large plastic or glass jar filled with moist dirt and ask the children to add the following items: A metal barrette or paper clip, a piece of plastic, a piece of aluminum foil, a piece of newspaper, a piece of food (apple, orange skin). Instead of one minidump for the whole class, different individuals or groups can make their own. Add a little "rain" from time to time.

Explain to the children that this is the way waste is piled on an open dump. Observe what happens over the following weeks to the objects in the jar. Over a period of time you can expect the food to rot and smell if the jar is opened. The newspaper will also decompose, the metal barrette will gradually rust, and nothing will happen to the plastic or aluminum foil. A group or individual could monitor the changes and put them on a chart.

The teacher should point out to the students that better ways of disposing of our garbage on the land are being developed. Children should be aware that the environmental problems associated with open dumps can be eliminated with sanitary landfills, which will continue to be the major form of disposal for many years to come.

Activity 7

Some problems with open burning of waste may be examined by using a tin can with air holes punched around the bottom. Loosely place in it small pieces of waste food (such as orange peel, egg shell, small piece of carrot), aluminium foil, plastic wrap, glass, and newspaper. In a safe place outdoors, the teacher should light a match to the contents. Have the children observe what happens.

Q- Do you see any smoke? Any ash?
Q- What things melt?
Q- Could the heat given off be used? For what?

The paper will burn easily. The food will char, but not really burn. The plastic will catch on fire and drip down into the pan, giving off fumes as a result of its petroleum base, and leaving a sticky residue. The metals will not burn at all.

Q- When we burn our garbage, where does the smoke go? Is this air pollution?
Q- What can happen to us when there is too much smoke getting in to the air?

Explain that waste can be burned safely and without bad effects on the environment if properly constructed and operated incinerators are used. These incinerators must have special controls to avoid polluting the air.

Activity 8

Explain that garbage can also pollute water. Illustrate by having the children place different types of garbage into a clear bowl containing clean water, shredded paper, food scraps, a tin can, a dark liquid such as coffee. Let the children observe the changes in the water after each addition.

Further state that water becomes polluted by garbage even when the garbage is not put directly into the water.

Illustrate by pouring some ink onto a mound of sand that has been placed in a bowl. Explain that the ink represents the pollutants in garbage. Sprinkle water over the mound (to represent rain) until it drains onto the bowl. Explain that the water would run off into rivers and lakes or would seep down into the ground and pollute the water there.

Topic Three—How Does Waste Affect Our Resources?

The materials we use come from the earth

Vocabulary: earth, soil.

Have the children name something made out of paper, metal, glass, and a favorite type of food.

Using the blackboard or a large piece of paper, help the children to trace these materials back to the source. Examples: Cereal box - paper - wood - trees - soil -earth. Pop bottle - glass - sand - rocks - earth. Metal can - rocks - earth. Apple - trees - soil -earth.

Ask the children if they can think of anything that they use that is not provided by the earth. (The children will probably name some things but, on close examination, it will be seen that these things are actually made from the earth's natural resources.)

Waste uses up the materials of the earth

Illustrate the use of a natural resource.

From a container labeled "earth," pass out clay explaining that this is an example of taking the earth's resources to make things with.

Let the children make models of things that they like to use.

Write the words BURY, BURN, and DUMP/LITTER on 3 small boxes or cups.

Let the students place their clay product into the boxes they choose.

Q- After we bury, burn, dump, or throw away our car, paper, etc., what will happen to it?

Repeat several times to show that as we buy and use products we use up the supply of the earth's materials. Point out that the resource container is now empty and that the resources have been used up; there is no more clay with which to make new things.

Point out how heavy the garbage can is, that someone will have to take it to the disposal site, that it would contribute to pollution, and that it will take up room at the site. Also, point out that it is still valuable material that can be used.

Q- Can we ever get back the things we threw away? Which ones, if possible?

Q- What is going to happen if we keep taking materials from the earth? What will happen when we run out?

Suggest that instead of throwing the clay away it could be reused. If we did this with all our garbage, very little would have to be hauled to a disposal site, and we would not take as much from the earth. Point our that the heat generated by burning could be used, thus saving some of our precious fuels.

The following illustrate that by wasting the things we use in our home we are using up the vital resource supply of the earth.

Ask each child to list all the different containers that provide his or her evening meal. (Include all the materials used to make the container.) For example, a child eats soup, hamburger, ketchup, apple sauce, carrots, ice cream and milk. The list might resemble the following:

Soup—metal can with label.
Hamburger—clear plastic and styrofoam wrap.
Ketchup—glass bottle, metal cap, paper label.
Apple Sauce—glass jar with metal top and paper label.
Carrots—plastic or paper bag.
Ice Cream—paper or cardboard container.
Milk—waxed cardboard container.

Ask the students to keep a count of each material used and the total containers used. They will be interested in seeing which family threw away the most items. Stress accuracy--there will be a tendency to give elaborate totals and to magnify the amount used.

When estimated totals are gained for the number of containers thrown away by the whole class for one meal, it will be a rather amazing number. (See activity eleven.) To continue this illustration, have the class multiply one meal by three to get an estimate for one day. Next multiply the class's total by the number of classes in the school. This total will be even more amazing to them.

An average count of throwaway containers per family should be made. Then multiply by the number of families for the total number of containers thrown away in your community for one day. Then multiply by 365 days in a year. Review that these containers are made of resources that are necessary for survival.

Have the students imagine that all the containers the class threw away last night were stacked up in a corner of the room.

Q- How much of the room would it occupy?
Q- How much of the room would a week's worth of garbage occupy?

It costs us money to dispose of our waste

If each person in your community (pop. _____) throws away 3.5 pounds of refuse each day:

Q- How many pounds does this equal in one day?
Q- How many tons is this?

Have the children try to imagine where all this refuse is being put every day of every year in every city. Reinforce that the above figures are only for your community.

You can also go further and get figures for your State and the entire U.S. Restate that these are resources that can be put to good use.

If it costs your town about $30 for each ton of refuse that is disposed of properly:

Q- How much does this cost per day?
Q- How much does this cost per year?
Q- Where does this money come from?

Some statistics on the board will help the students to realize the enormous amount of resources we are throwing away. We Americans throw away each year approximately:

28 billion bottles--glass
60 billion cans--metal
4 million tons of plastic--petroleum
40 million tons of paper--wood
100 million tires--rubber
3 million cars--metals

To have the children better grasp these enormous numbers, ask them if they stacked 1 million pennies on top of each other, how high the pile of pennies would be. Answer: over 5,000 feet. (Compare to the height of a familiar mountain, monument, or building.) This is an easy math problem using about 15 pennies to the inch.

Topic Four—Why Is There So Much Waste?

Population and lifestyle affect the amount of waste

Draw a square on the floor with chalk, approximately five feet by five feet. This square can also be delineated by grouping chairs to form the perimeters. Ask one child to step inside the square holding one piece of solid waste, probably scrap paper. Emphasize that each person involved cannot step outside the square once he or she is in it.

Then ask another to step in, assume they then have two children, those two marry and have two children, etc. The number will grow very quickly, yet the square remains constant. Ask the students how they would be able to get anyone out of the square. As the square grows more crowded, obvious reactions will be observed, especially pushing, restlessness, and general aggressive behavior.

Ask all the students to return to their seats, having first dropped their pieces of solid waste in the square. The result they will see will certainly be solid waste pollution. This graphically brings home the concept of more people, more waste, that our crowded cities have limited space, and that the amount of waste pollution increases every year.

ACTIVITY

16

A visual aid in the form of a bulletin board or display could be constructed using packages and pictures of packaging brought from home by teachers and students. Actual packages work best, but carefully chosen pictures are also valuable. The bulletin board display can evolve into a comparison of "good" and "bad" packaging. If pictures or student drawings are used, a theme on how packaging has changed could be developed. A discussion of which packages are excessive and not needed could be held. The board can be broken down into three categories:

1. Nature's packaging: coconut, bananas, peanuts, etc.
2. Older types of packaging: paper bags, pottery, returnable bottles.
3. Modern packaging: plastic wrap, styrofoam, egg cartons, plastic-coated milk containers, individually wrapped packets.

Q- What are these packages made of?
Q- Where did they originally come from?
Q- Can they be recycled or reused? Which ones?

Point out the ways in which packaging can prevent waste: reducing spoilage, individual servings, distribution efficiencies, etc. Ask if some packages seem to use excessive materials and thus contribute to the waste problem.

Q- How would you design an ecological package (one that requires as little energy and as few resources as possible for its production or disposal)?
Q- What about the ice cream cone? What other packages can you eat?

Topic Five—What Can We Do About Waste?

Recycling takes old waste and turns it into new materials

Vocabulary: recycle

This activity is very important since it introduces the concept of recycling and reuse as an alternative to disposal. The children should become very familiar with the word "recycle" and use it frequently.

Write the word "recycle" on the board or a large sheet of paper. Next to it draw a picture of a bicycle wheel. Point out to the children that both end in the word "cycle."

A bicycle wheel goes around and around--the word recycle means to use over and over again or go around.

Point out that when we recycle something, it does not add to our disposal problem but goes back around into something new. Old paper can become new paper. Old cans and glass become new cans and glass, toys, etc.

Have the children imagine something old and what it could be turned into by recycling. Example: an old soup can may become part of a new fire engine; a pop bottle may become a new window in the school.

Q- Has anyone ever heard of a "junkman" who goes around looking for people's trash?

Q- What might there be in one person's waste that would not be trash or waste to someone else?

A possible homework assignment related to this concept would be to ask the students to write a short story, real or imaginary, describing something valuable that they found buried in the garbage. The stories should include accounts of the previous owners and reasons why the objects were thrown away.

List the possible advantages of recycling:

1. Reducing pollution
2. Saving natural resources
3. Saving energy
4. Saving money

Set up a "use-it-again" box for your classroom. Have the students paint, color, or paste pictures on it. Place in it all materials that can be used again. For example, paper that has only been used on one side can be used again for drawing paper, quiz sheets, etc. Craft items from home can also be brought in to make collages and other art projects (egg cartons, margarine tubes, thread spools, etc.)

Set up a "swap box" where the children can bring in old toys or objects that might be thrown out. They can trade an old toy for another one that is new to them.

Have a show-and-tell session where the children bring in objects and discuss how they could be reused or recycled.

If there is a recycling program in your community where you can bring paper, cans, bottles, or other materials, set up a recycling box for the classroom. Markets for collected materials may be found under "wastepaper," "scrap dealers," or "recycling centers" in the Yellow Pages. When you take the materials to the center bring the class to see how it is run. If you receive money for the recyclables plan a class trip children will remember.

Organize a play or a fair (or both) centered around the theme of recycling and its possibilities. If you have a fair you might include artwork related to recycling, collages made out of scrap, and inventions made entirely out of recycled materials. This could be particularly important if your town does not recycle, for you could turn this class learning experience into an educational opportunity for your whole community.

Take a field trip to a papermill to see how paper is made.

Things to do at at home:

Use things more than once:

1. Use grocery bags to hold garbage instead of buying garbage bags.
2. Use grocery bags to wrap packages to send.
3. Use grocery bags for art projects.
4. Use small bags to carry your lunch to school.

Give things that we can no longer use to people who can use them.

Recycling in nature

ACTIVITY 25

Vocabulary: mold

Mold Gardens - How things change.

As a demonstration place very small pieces of fruit such as apple, orange skin, and bread on top of some moist soil in a container. Cover with clear plastic and rubberband. Observe the changes.

Ask the children if they know what is growing on the food? Explain to them that these are molds and that they help return things to the soil by feeding on the food.

ACTIVITY 26

This activity completes the cycle by showing that recycling is something nature has been doing all the time.

Collect dead leaves in several stages of breakdown.

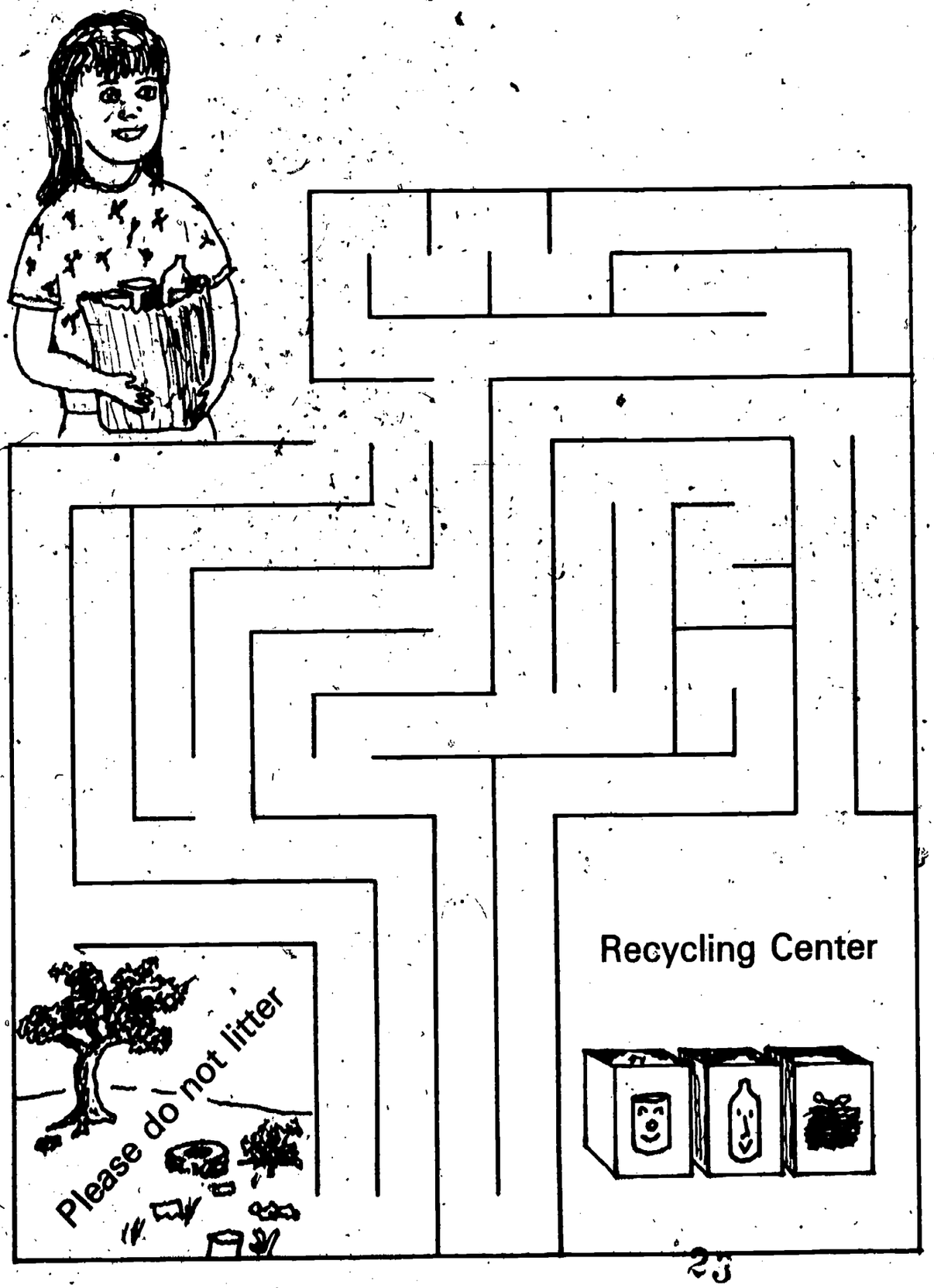
Q- Do you know what becomes of all the leaves that are on the ground in the fall.

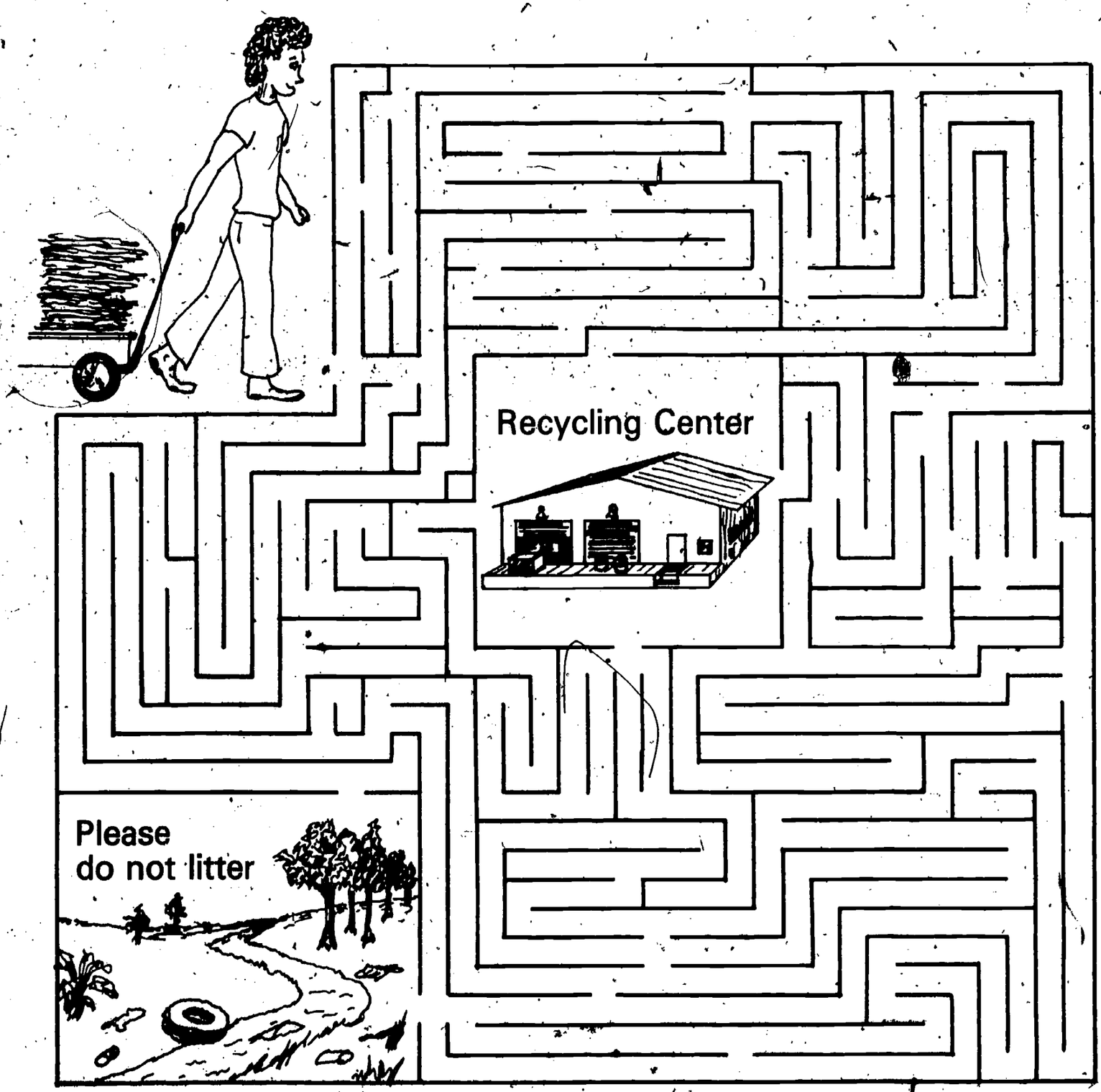
Q- Where do they go next summer?

Make the connection that leaves become soil by letting the children see and feel the layers of leaf and soil that you collected.

Make a large art project showing the cycle of leaves. The illustration would show how a tree's leaves fall, decay into the soil, nourish the tree by making the soil richer, and thus help the tree to grow and produce more leaves.

Another way to illustrate would be to print the following words on 3 x 5 cards: soil, buds, roots, green leaves, trunk, dead leaves, branch. Distribute the seven cards to seven children at random. After each child has shown its card to the class, give a long piece of string to the child holding the card marked "soil." Ask the children to arrange themselves in the proper order of growth. As each determines its corresponding position, he or she should take hold of the string. They should end up in a circle.


Please do not litter
Recycling Center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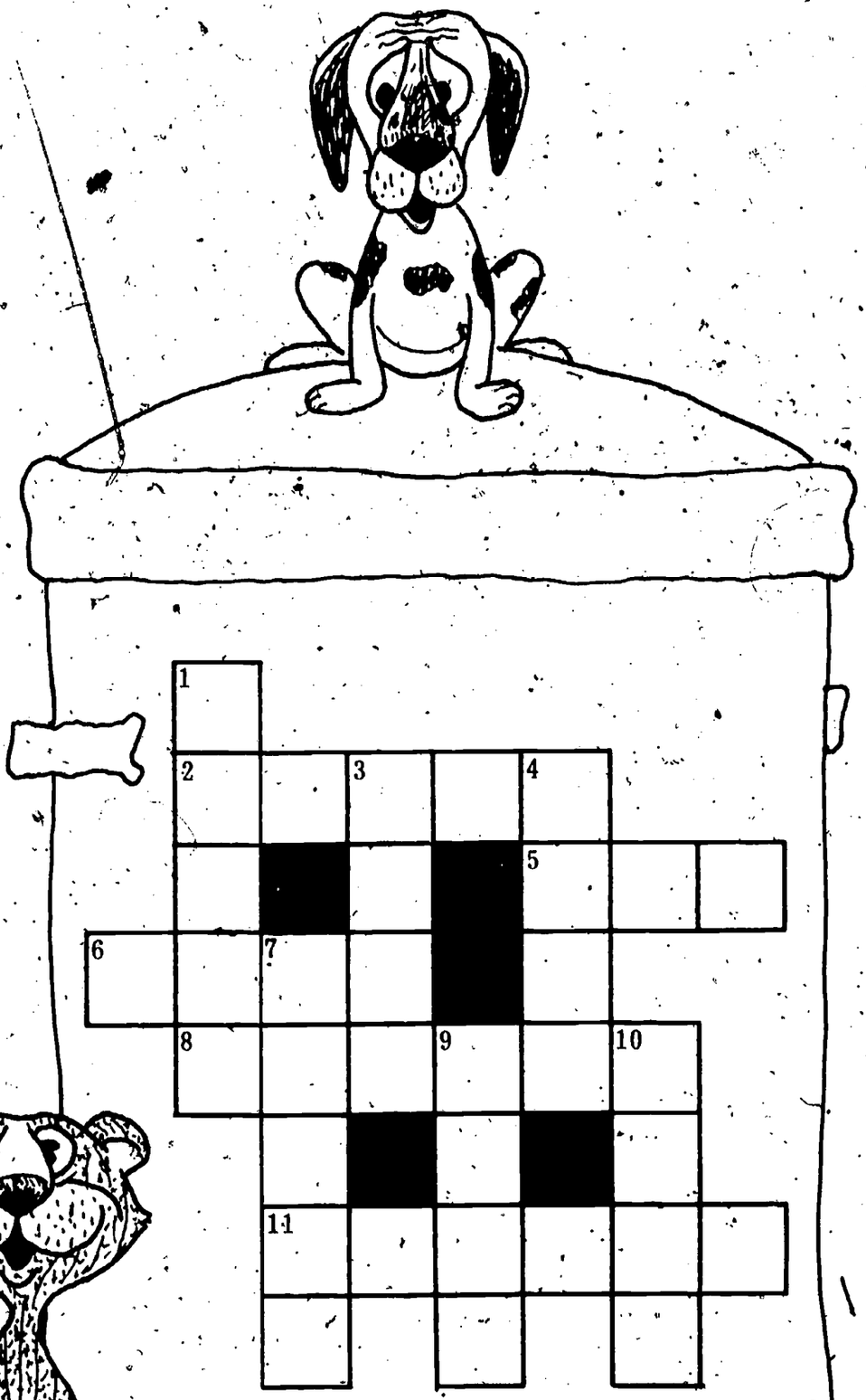
Please
do not litter

Crossword Puzzle



Down

1. Cans are made of this.
3. Items made of iron or steel will do this if left outside.
4. Where recycling begins.
7. These are made of rubber and take up a lot of space at disposal sites.
9. A lot of paper can be made from one.
10. Old clothes, towels, and sheets.

Across

2. Everything we make and use comes from here.
5. Used to make plastic and to run machines.
6. They like to live at open dumps.
8. Trash which is thrown along highways and in parks.
11. We can produce this when we burn waste.

Answers on inside back cover.

Grades 7-12

Topic One—What Is Waste?

Waste is material that is no longer used or needed

ACTIVITY 1

Q- What is waste?
Q- What are some of the other names we have for waste?

Using a good dictionary, look up and discuss the cultural origins of the words garbage, trash, junk, refuse, rubbish, scrap. List the above words in their order of offensiveness to you. Does this list have any relation to the origin of the word?

Q- What types of waste are produced from an average household?
Q- Which ones are in the greatest quantity?

A display can be set up illustrating the different types.

ACTIVITY 2

Identify the types of waste that result from the production, consumption and disposal of a can of beef stew. The main components to be traced are meat, potatoes, tin can, paper label.

For example: MEAT--grain from the earth, steers eat grain, steers slaughtered, we eat beef. Result--grain waste, manure waste, slaughter waste, sewage waste, table scraps.

Topic Two—How Do We Dispose of Our Waste?

Present solid waste disposal causes pollution of our air, water, and land

Q- What is meant by "throwing something away?"
Q- Where is away?
Q- How are waste products disposed of in our society? (Dumping, littering, burying, recycling)
Q- How does our town dispose of its residential waste?

This activity should take place in a laboratory with the proper equipment such as goggles, bunsen burner, tongs, and a fume hood.

Proper Ventilation and Safety is stressed, especially for plastics.

Break the class into teams. Give each team 5 to 10 materials to burn. Prepare a data sheet or a chart for noting the initial weight and residue weight of each item burned, the color of flame and smoke, and the odors produced.

Burn a variety of household waste including food, metal, plastic, paper, etc.

Q- What are the components of the smoke? Could they be harmful?
Q- Could the smoke be filtered or cleaned to render it harmless to our environment?
Q- What are the advantages of burning our waste? (reduction in volume, breakdown of some dangerous chemicals, etc.) Could the heat generated be productively used?
Q- Does your community burn any of its waste? Does it use effective antipollution control equipment?

ACTIVITY 5

Take a large plastic or glass jar and fill it with moist soil. Add small pieces of the following objects: A metal barrette or paper clip, newspaper, plastic, food (apple or orange peel), aluminum foil. Add a little "rain" from time to time.

Explain that this is the way solid waste is piled on an open dump. Periodically over the following weeks, examine the things in the jar to see if anything happens to them. Over a period of time you can expect the food and newspaper to begin to change. The metal will rust. Nothing will happen to the plastic or aluminum foil. Make a chart to display your findings.

Q-- Do you know the location of any open dumps in this area? What do you think of them?

Q- How does an open dump pollute? (Water pollution from liquids and metals leaching to groundwater supply. Air pollution caused by smoke from fires and gases after decomposition of materials. Many open dumps are found in wetlands, interfering with ecosystem maintenance and flood control. Odors and rat infestation. Unsightly. Uses up valuable land that is in short supply.)

Q- What happens when we run out of space to dump?

Q- In what ways would it be better if the waste was buried in a sanitary landfill--one designed to prevent leaching and build-up of gases from decomposition? What problems would still remain?

ACTIVITY 6

Discuss litter.

Q- What is litter? Name some examples that can be found on the way to school.

Q- What is the most common type?

Q- Who are the worst litterbugs?

Q- What are the social and environmental costs of litter?

Q- How could littering be reduced or stopped?

Waste disposal costs money

Find out the population in your community. If each person throws out about 3.5 pounds/day:

Q- How many pounds are disposed of per week, month, and year per person?

Q- How many tons of solid waste are generated in your community each day?

Q- How much does an average family "throw away" per week?

Q- How much is thrown away each year in the United States based on your community's average? (Population = 225 million, answer = 144 million tons/year.)

As a homework assignment have the students list all the containers that made their evening meal. Have them involve their parents. List bags, bottles, jars, cans, and packages. Calculate total containers per class, school, and city (_____ families) for one meal.

Q- How much does it cost our town to dispose of its refuse for one year if it cost $30 to dispose of one ton?

Q- Where does this money come from?

Find out from your Department of Sanitation how much the weight and cost of waste has changed in your community over as many years as records are available. Graph the results to show the increase.

Waste has value when it is reused or recycled

Ask the students to think about the different kinds of things people throw away.

Q- Would rich people throw out different kinds of things than poor people? What about the junkman or the antique stores?

Q- What might there be in one person's trash that might be a treasure to others? Relate any personal experiences with such discoveries.

Q- Has anyone in the class sold scrap metals or furniture for money?

Q- Can we ever get back the things we throw away?

Recycling is a process of use and reuse

Q- What does recycle mean?

Break the word into parts:
RE-CYCLE

Q- What does the prefix "re" mean?

Q- What are some other words that begin with that prefix? (repair, redo, return, resource, renew, restore)

Q- What does the word "cycle" mean?

It should become clear from the above that recycle means to do or use over and over again. From old cans come new cans, from old paper new paper is produced.

How can recycling reduce pollution and the cost of waste disposal? (See Topic Five for a more complete discussion of recycling and reuse.)

Topic Three—How Does Waste Affect Our Resources?

The materials we use come from the earth and are in limited supply

List on the blackboard the different materials that compose refuse. Trace each of these back to its original source. (Paper to wood to trees to soil to earth. Glass to sand to pebbles to rocks to earth. Metal to rocks to earth. Plastic to petroleum to fossil plants to earth. Food to animals and plants to earth.)

Investigate where different objects in your classroom come from.

Introduce the word "resource" as anything that is available for valued use or has plant, animal, or human utility.

Q- What are the natural resources in the above list?
Q- Why are natural resources important?
Q- Are our resources in endless supply?
Q- What will happen if we continue to waste our natural resources by burning, littering, dumping, or burying them?
Q- Can we invent anything that does not use up natural resources?

Some resources are non-renewable and thus irreplaceable

ACTIVITY 12

In order to introduce the concept of renewable versus nonrenewable natural resources, the class should obtain a collection of items that would normally be included in the waste stream. Examples of products from natural resources that can or cannot be renewed (or re-created):

* aluminum cans, from bauxite (nonrenewable)
* tin-plated steel cans, from iron and tin (nonrenewable)
* glass bottles, from sand, soda ash, and limestone (nonrenewable, but in plentiful supply)
* paper, from wood (renewable)
* cardboard, from wood (renewable)
* organic waste, such as plant clippings and food scraps (renewable)
* plastic containers or bags, from petroleum (nonrenewable)

The students should be helped to examine these and discuss where the raw materials to make them come from. In the discussion it should be pointed out that aluminum, tin, steel, and petroleum are all nonrenewable resources, and, as such, are being wasted daily under our present disposal system. Paper and cardboard come from the renewable source of wood (trees), but that is being used at a faster rate than it can be produced commercially. The students should be able to place the solid waste discussed into the categories of renewable and nonrenewable resources.

Why are some materials nonrenewable? Because they are the result of geological processes which take millions of years to complete.

ACTIVITY 13

The following suggests the quantities of some of the products Americans use each year.

28 billion bottles--glass
54 billion cans--metal
4 million tons of plastic--petroleum
40 million tons of paper--wood
204 million tires--rubber
3 million cars--metals

How big is a billion? Calculate the height of one million and one billion pennies stacked on top of each other. There are 15 pennies to the inch.

Have the students imagine the land space required to dispose of these items. Also remember that these are only final products.

Resources are unequally distributed around the world

ACTIVITY 14

Mount a map of the world on the wall. Have the students list the raw materials used to make paper, plastic, metal cans, aluminum cans, rubber, etc. Include oil as the energy source to manufacture these products.

Pinpoint each primary source on the map. State the fact that the United States, which possesses only 5 percent of the world's population, uses about 40 percent of its resources.

Q- What countries are involved in supply?
Q- Does our consumption of resources affect the people who live in these countries?
Q- What could happen if other countries begin to consume as much as we do?
Q- What could happen if available resources begin to run low? What would be the effects on society?
Q- Does scarcity of resources increase the possibility of war?
Q- How can we begin to lessen our dependency on foreign countries for resources? What will be the effects of such actions on our society?

Discuss alteratives including reducing consumption and recycling.

Energy is required to process raw materials and manufacture products

ACTIVITY 15

Q- Is energy a resource?
Q- What sources of energy are available for human use? (oil, coal, wind, water, sun, nuclear, etc.)
Q- Are any of these in short supply?

Identify and list the types and points where energy is required in the mining, transportation, and manufacture of glass, paper, or metal items. Point out that resource conservation reduces the need for energy and that recycling some materials takes less energy than their original manufacture (aluminum, for example).

Discuss the option of burning solid waste to generate energy and reduce the need for other fuels.

Topic Four—Why Is There So Much Waste?

Waste generation varies according to population and lifestyle

Packaging materials account for more than 50 percent of all consumer waste. This packaging has grown quickly in volume over a very short period of time. From 400 pounds per person in 1958 to over 6000 pounds per person at the present time. In earlier times packaging was at a minimum and items were sold in either natural or reusable containers. Today, packages range from soup cans to plastic bubble packs that hold a dozen screws.

To demonstrate how life styles effect the amount and types of packaging used, have the students make up a typical meal. List all the containers and packaging that come with the items. Remember a glass bottle or can is a package. Examples:

Chicken--clear plastic over paper plate.

Carrots--Plastic or paper bag, or box if frozen.

Discuss the purposes of packaging. Some of these are: reduction in waste due to spoilage, prevention of contamination, increased efficiency in distribution, portion control, and product attractiveness.

Q- What purposes do the listed packages serve?
Q- Have you noticed an increase in packaging over the last few years?
Q- Are any products overpackaged?
Q- What packaging would you suggest for your imagined meal?
Q- Which packages could be recycled?

Conduct a survey in you local supermarket looking for examples of the following three types of packaging:

1. Natural packages, i.e., oranges.

2. Older and reusable packages, i.e., paper bags, paper wrapping, glass jars that become drinking glasses, returnable bottles.

3. Modern packages, i.e., plastic, styrofoam, tin foil, individual wrappings.

Find five of #1, five of #2, and ten of #3. Make a large list for the entire class.

Construct a display or bulletin board of different types of packages or pictures.

Q- What purpose does packaging serve?
Q- How dependent is the product on the package?
Q- How could each package be reused or recycled?

From your list, decide which packages reduce waste and which increase waste.

Topic Five—What Can We Do About Waste?

Plants and animals depend upon nature's continuous recycling process

ACTIVITY 18

Discuss the following cycles with the students. Have the students give examples which they see around them.

1. Nutrient Cycle

Plants take up nutrients from soil to make sugar.

Animals eat plants and return nutrients to soil through body wastes.

Plants and animals die and decay, returning nutrients from decaying parts to soil.

2. Oxygen Cycle

Plants give off oxygen as a waste product of photosynthesis.

Animals take in oxygen for respiration.

Animals exhale Co_2.

Plants use Co_2 for photosynthesis.

3. Water Cycle

Sun evaporates water from oceans and lakes.

Water vapor forms clouds when cooled.

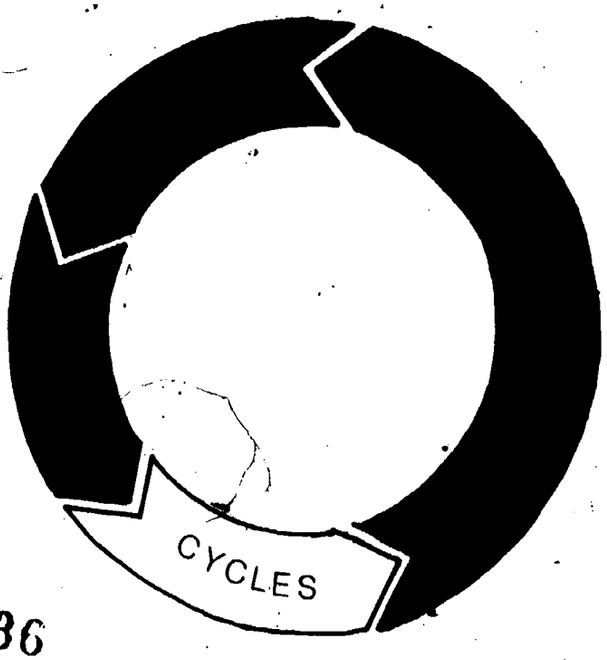
Clouds release water as rain.

Plants and animals use water.

Water not used runs into lakes and oceans.

4. Mineral Cycle

Matter is continually being built up into mountains and then eroded into sediment. What was once sediment on an ocean floor becomes the highest mountains, which eventually return to the sea. New mineral matter is vented from volcanos while other minerals are being returned to the earth's interior.



Activity 19

Composting is a process whereby plant material is returned to the soil by the action of microscopic fungi and bacteria. This class of organisms is called decomposers and is a vital link in nutrient cycles. The process enriches the soil as a natural fertilizer while reducing the amount of solid waste requiring disposal.

The students can make and investigate their own compost operation.

1. Place the following or similar organic material in a plastic bag or outside in a marked area: fruit peels, leaves, old bread, coffee grounds, green tops of vegetables, potato peels.
2. Chop and mix them up with some water and soil.
3. Twist and tie the bag securely, or cover the mound with earth.
4. Open the bag once a day to allow oxygen inside. It is needed by the decomposers for breakdown of the materials.

Discuss what is going to happen. Have the students keep a record of the process of decay. Note odors, texture, and other changes.

Q- Which materials decay the fastest?
Q- How long does the complete decay process take?

Make a wet-mount preparation and stain to use as a microscopic examination of the decomposers.

Q- How many different types of organisms can be found?
Q- What would our landscape look like if these organisms did not exist?
Q- What objects would not decay if placed in our compost pile?

Activity 20

To illustrate the nutrient cycle take a soil profile by digging out a wedge of soil about 4 to 6 inches deep. Use a location where there are freshly fallen leaves. Observe the layers of leaf breakdown into the rich topsoil. Peel off each layer. What other things besides leaves can you find in the profile that might hasten decay? Look closely.

The same could be done with a rotting log. How do its inhabitants hasten decay?

Activity 21

To illustrate the water cycle, make or show the students a terrarium. The following materials are needed: glass container with an airtight top, gravel, soil, various types of small plant life.

Have the students observe the water droplets clinging to the top. Where does this water come from? Is it necessary to ever add water to a terrarium?

To further illustrate condensation point out to the students that when the weather is cold they "see their breath." This is due to water vapor being released as we exhale warm air and condensing on contact with colder air. The same process is involved in cloud formation. Steam is another example.

People can imitate nature by giving new life to materials that are decay resistant or in short supply

ACTIVITY 22

Several products found in solid waste from the home and school can be recycled. This activity serves as a review of solid waste problems and explains how glass, paper, aluminum, and tin-plated steel cans are recycled. The activity is taken from the Environmental Action Council's "Don't Waste Waste."

Introduction and Review

The teacher should try to elicit the sequence of steps in recycling these materials. Also a comparison can be made of how these items pollute when dumped or burned on the land versus the effect recycling has on their fate.

GLASS is made from soda ash, sand, and lime. It can remain in a disposal site indefinitely and does not break down into its organic components. To be recycled, it must first be sorted by color and crushed into small pieces called "cullet." The cullet is melted down into a solution and then molded into glass containers. Other products made from recycled glass bottles are insulations, and road-patching material.

ALUMINUM is made from bauxite, which is a nonrenewable resource. It takes a great amount of electricity to produce aluminum. Nature cannot decompose or break it down, so disposal is a problem. When it is recycled it is melted and then shaped again into new cans and other items. Making aluminum cans from old aluminum takes only 5 percent as much electricity as from bauxite.

TIN-PLATED STEEL CANS are made of iron ore and tin, neither of which are renewable resources. The cans will eventually rust and break down, so they are not as much of a problem as some other metals. However, throwing them away is a waste of valuable metals. In the recycling process the cans are put into a huge container with holes in the bottom. This container is immersed into a caustic solution which takes the tin off the cans. Then the steel cans are washed and sold as Number 1. Grade Steel. The tin is removed from the caustic solution by electrolysis and made into ingots which are sold to companies requiring tin.

PAPER is made from a renewable resource--trees. Paper is recycled by first shredding it into small pieces and mixing it with water. This mixture is beaten into a mush-like pulp which flows onto a moving screen through which most of the water passes. The wood or paper fibers remain. The fibers are pressed through heavy rollers that remove more water and then sent through steam-heated dryers. The result is recycled paper. You can make recycled paper in class.

This activity can become a research project for small groups or individuals. Suggested topics for the groups are The Story of:

* an Aluminum Can
* a Plastic Tube
* a Cardboard Box
* a Tin Can
* a Glass Bottle

Reproduce and give each student the following material to help them tell about their particular resources.

THE STORY OF THE _____

I am a(n) _____ container. Please tell my story by finding answers to the following question:

1. What do I look like?
2. Why do I have a label?
3. What are some of the things I am used for?
4. What am I made of?
5. Where do my manufacturers get the raw materials to make me?
6. Are large amounts of my raw materials available?
7. How many years will my raw materials probably last?
8. Is there any pollution of the land, the air, or the water, when companies extract my raw materials from the earth? If so, how?
9. How do manufacturers change the raw materials to make me?
10. Does the changing of my raw materials cause pollution of the land, the air, or the water? If so, how?
11. Am I thrown away after I am used?
12. What chemicals are released when I am burned? Are they harmful if released into the environment? Can they be filtered and disposed of properly?
13. Do I break down into earth again if I am buried? If so, how?
14. Do I disingegrate if I am thrown into a river, lake, or ocean? If so, how?
15. What are some ways in which I could be re-used?
16. Can I be recycled? Am I recycled? Where am I recycled?
17. What happens to me when I am recycled?
18. Can I be safely burned to produce energy from the heat?
19. Who pays the real cost for manufacturing and disposing of me?
    - *The manufacturer who makes me?
    - *The company which uses me?
    - *The consumer who buys me?
20. Who is responsible for disposing of me? Who pays the cost for disposal?
21. Do you think I am a good container? Why or why not?

By recycling we can reduce pollution, conserve limited natural resources and energy, and save money

ACTIVITY 23

Each classroom may want to begin to recycle its wastepaper. Is there a recycling program in your community? Check in the Yellow Pages of your telephone directory under "recycling programs," "waste paper," or "scrap dealers," for a market for your paper. Be sure to ask exactly what kind of paper they accept (newspapers, magazines, white bond paper, etc.), and if they would also accept glass, aluminum, bi-metal cans, etc.

Have the students record the weekly or monthly results of their program. Record and graph the reduction in solid waste disposed through old systems and the amount of glass, paper, and cans recycled.

Follow and record the fluctuations in the selling price of the recycled materials. Research the reasons behind these changes. Calculate total money saved.

Find out how much paper your class, other classes, and your school are recycling. Encourage the students to tell their parents about recycling.

ACTIVITY 24

Have the students survey at least three different people concerning their attitudes toward recycling to get an idea of the differences of opinion that exist. They should interview their friends, parents, and neighbors on whether or not they would be willing to source separate their garbage (for example, setting newspapers in stacks apart from other waste) so it could be more easily recycled.

Sample Survey Questions

1. Would you recycle? At home? In the office?
2. Why would you recycle? Why not?
3. What would encourage you to recycle?
4. Which is more important to you about recycling?
   * Saving money?
   * Reducing pollution?
   * Reducing the need for additional sanitary landfill sites?

Make a chart on the board and tabulate results. This activity can develop a number of excellent process skills such as interviewing, measuring, categorizing, comparing, and observing.

ACTIVITY 25

Besides reducing pollution and saving natural resources and energy, your community can save money by recycling. For this activity, assume that your community could save about $30 per ton in disposal cost and earn $10 for each ton of material sold to a scrap dealer.

Q- If 30 percent of all of the community's refuse could be recycled, how much money could the city make in one year?

ACT 26

Given the physical properties of tin-plated steel, glass, and aluminum, devise a mechanical system for separating them out of the solid waste which comes from a home.

ACT 27

Make a survey of products in a supermarket that are made from recycled materials. Look for the recycling symbol on boxes and bags.

ACT 28

Research why there aren't more recycled materials in the marketplace. The more we recycle the more recycled materials will begin to appear. Are there any barriers that favor virgin materials over recycled ones?

ACT 29

Research and debate the issue of the returnable bottle versus the no-deposit, no-return one. What effect will returnable bottles have on a recycling program?

ACT 30

Visit paper mills or glass manufacturers who produce the products that become our solid waste.

ACT 31

Discuss ways that businesses and the government can contribute to the solution of the solid waste problem. For example, many businesses and commercial enterprises recycle their office paper and corrugated cardboard, and the Federal government has a program to recycle all of its high-grade office paper. Do businesses in your community recycle their paper? Perhaps older students can conduct a survey of local merchants and businesses to determine the amount and types of waste they produce and whether they are currently doing any recycling. Supermarkets or chain stores are a good place to start since many of them bale and recycle their cardboard wastes. If a nearby Federal government building or a private office building has a paper recycling program, you may want to plan a class trip to see how it works.

PAGES 33-36 "THROWAWAY THREE: A SHORT SKIT" REMOVED DUE TO COPYRIGHT RESTRICTIONS

Discussion

The skit shows the children that people have historically gotten rid of solid waste successfully by throwing it out, burying it, or burning it. But none of these methods solves modern urban garbage problems. The discussion should attempt to reinforce this concept. One way this can be done is to discuss the characters in the skit: how they disposed of their garbage or trash and why their method of doing so was either satisfactory or not satisfactory.

Monkey: Threw it down.

No problem developed because no large concentration of monkeys existed. The garbage disintegrated.

Cavedweller: Threw it, burned it, buried it.

These acts still did not cause a problem for the same reasons.

Roman: Threw it.

Tossing out garbage began to be a problem because of the many people who lived in cities, but it was easily solved by taking the garbage out of the city.

Briton: Threw it.

A problem grew because more and more people moved to the cities, thus producing more trash than they could get rid of in the city.

Settler: Had virtually no garbage.

Colonist: Threw it, burned it, buried it.

Greater trade resulted when people did not use goods until they wore out, but then more things to be discarded began to accumulate.

Industrialist:

With a greater concentration of people in cities than ever before and more buying because machine-made goods were cheaper, much more was thrown out.

Scientist:

The big change to synthetics plus the use of enormous amounts of natural resources are causing tremendous problems.

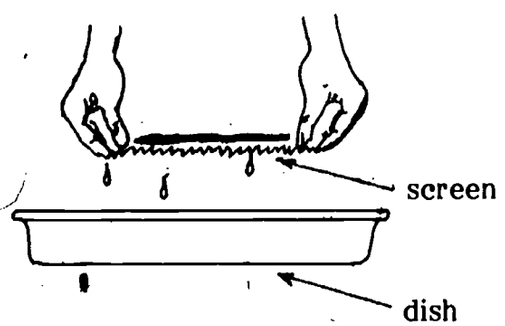
We can't throw away our trash. There simply is no such place as away. Care is always required to prevent our trash from having bad effects on our lives.

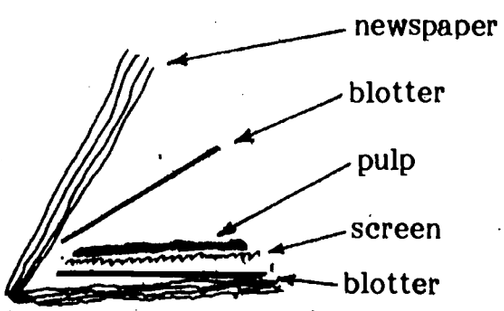
We can't bury it all. Not enough places are available. Besides, the modern synthetics do not rot when buried.

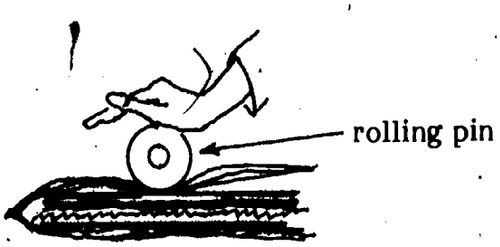
We can't burn it all. Some of the synthetic goods simply won't burn. Most of the burning requires expensive and often elaborate controls to prevent air pollution. And there is always ash or something left over which must be buried.

We are literally running out of some natural resources so that any form of disposal of certain goods is self-defeating.

Make Your Own Paper







What you need

10 pieces of tissue or newsprint
A piece of screen
A flat dish, a little larger than the screen
4 pieces of blotting paper the size of the screen
A bowl
An egg beater (it works better with a blender)
A round jar or rolling pin
Newspaper and blotter paper
2 cups of hot water
2 teaspoons of instant starch (for stronger paper, if desired)

What to do

1. Tear the paper into very small bits into the bowl. Pour in the hot water.
2. Beat the tissue and water to make pulp.
3. Mix in the starch if desired.
4. Pour the mixture into the flat dish.
5. Slide the screen into the bottom of the dish and move it around until it is evenly covered with pulp.
6. Lift the screen out carefully. Hold it level and let it drain for a minute.
7. Put the screen, pulp side up, on a blotter, on some newspaper. Put another blotter over the pulp, more newspaper over that.
8. Roll the jar over the sandwich to squeeze out the rest of the water.
9. Take off the top newspaper. Turn the blotter sandwich over so that the screen is on top. Then take off the blotter and the screen very carefully. Don't move the pulp. There is your paper.
10. Put a dry blotter on the pulp and let it dry.

State Solid Waste Agencies

Alabama
Division of Solid Waste
and Vector Control
Department of Public Health
State Office Building
Montgomery, AL 36130
205-832-6728

Alaska
Air & Solid Waste Mgmt. Program
Department of Environmental
Conservation, Pouch 0
Juneau, AK 99811
907-465-2635

American Samoa
Environmental Quality Commission
American Somoa Government
Pago Pago, American Samoa 96799
(overseas oper.) 633-4116

Arizona
Bureau of Sanitation
Department of Health Services
411 North 24th Street
Phoenix, AZ 85008
602-255-1156

Arkansas
Solid Waste Management Div.
Department of Pollution Control
and Ecology, Box 9583
Little Rock, AR 72219
501-371-1701

Solid Waste Program
Department of Energy
3000 Kavanaugh
Little Rock, AR 72205
501-371-2234

California
State Solid Waste Management
Board, Box 1743,
1020 Ninth Street
Sacramento, CA 95814
916-322-3330

Hazardous Material Mgmt. Section
Department of Health Services
744 P Street
Sacramento, CA 95814
916-322-2337

Colorado
Department of Public Health
4210 East Eleventh Avenue
Denver, CO 80220
303-320-8333

Commonwealth of
North Mariana Islands
Environmental Protection Board
Dept. of Health Services
Saipan, Mariana Islands 96950
(overseas oper.) 9370

Div. of Environmental Quality
Department of Public Health
and Environmental Services
Saipan, Mariana Islands 96950

Connecticut
Solid Waste Management Unit
Dept. of Environmental Protection
165 Capital Avenue
Hartford, CT 06115
203-566-3672

Industrial & Hazardous Materials
Management Unit
Dept. of Environmental Protection
(same address as above)
203-566-5148

Connecticut Resource Recovery
Authority, Suite 603
179 Allyn Street
Hartford, CT 06103
203-549-6390

Delaware
Solid Waste Management
Department of Natural Resources
and Environmental Control
Edward Tatnall Building
Dover, DE 19901
302-678-4764

District of Columbia
Dept. of Environmental Services
415 Twelfth Street, NW.
Washington, DC 20004
202-727-5701

Florida
Solid Waste Management Program
Dept. of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32301
904-488-0300

Georgia
Environmental Protection Div.
Dept. of Natural Resources
Rm. 822
270 Washington Street, SW.
Atlanta, GA 30334
404-656-2833

Guam
Environmental Protection Agency
Government of Guam
P.O. Box 2999
Agana, GU 96910
(overseas oper.) 646-8863

Hawaii
Environmental Health Division
Department of Health
P.O. Box 3378
Honolulu, HI 96801
808-548-6410

Idaho
Solid Waste Management Section
Department of Health & Welfare
Statehouse
Boise, ID 83720
208-334-4108

Illinois
Division of Land & Noise
Pollution Control
Environmental Protection Agency
2200 Churchill Road
Springfield, IL 62706
217-782-9800

Indiana
Solid Waste Management Section
Division of Sanitary Engineering
State Board of Health
1330 West Michigan Street
Indianapolis, IN 46202
317-633-0176

Iowa
Air and Land Quality Division
Dept. of Environmental Quality
Henry A. Wallace Building
900 East Grand
Des Moines, IA 50319
515-281-8853

Kansas
Solid Waste Management Section
Dept. of Health & Environment
Topeka, KS 66620
913-862-9360, Ext. 297

Kentucky
Division of Hazardous Materials
and Waste Management
Department for Natural Resources
and Environmental Protection
Capital Plaza Tower
Frankfort, KY 40601
502-564-6716

Louisiana
Department of Natural Resources
P.O. Box 44396
Baton Rouge, LA 70804
504-342-4506

Maine
Div. of Solid Waste Mgmt. Control
Bureau of Land Quality
Dept. of Environmental Protection
State House, Station 17
Augusta, ME 04333
207-289-2111

Maryland
Water and Waste Mgmt. Program
Water Resources Administration
Department of Natural Resources
Tawes State Office Building
Annapolis, MD 21401
301-269-3875

Community Health Program
Dept. of Health & Mental Hygiene
201 West Preston Street
Baltimore, MD 21201
301-383-3123

Massachusetts
Bureau of Solid Waste Disposal
Department of Environmental
Management, Rm. 1905
100 Cambridge Street
Boston, MA 02202
617-727-4293

Div. of Air & Hazardous Materials
Department of Environmental
Quality Engineering
600 Washington Street, Rm. 320
Boston, MA 02111
617-727-2658

Hazardous Waste Section
Div. of Water Pollution Control
Department of Environmental
Quality Engineering
110 Tremont Street
Boston, MA 02108
617-727-3855

Michigan
Environmental Protection Bureau
Department of Natural Resources
P.O. Box 30028
Lansing, MI 48909
517-373-2682

Resource Recovery Division
Department of Natural Resources
(same address as above)
517-322-1315

Hazardous Waste
Environmental Services Division
Department of Natural Resources
(same address as above)
517-373-3560

Minnesota
Division of Solid Waste
Pollution Control Agency
1935 West County Road, B-2
Roseville, MN 55113
612-296-7315

Mississippi
Div. of Solid Waste Management
and Vector Control
State Board of Health
P.O. Box 1700
Jackson, MS 39205
601-982-6317

Missouri
Solid Waste Management Program
Department of Natural Resources
P.O. Box 1368
Jefferson City, MO 65102
314-751-3241

Montana
Solid Waste Management Bureau
Department of Health and
Environmental Sciences
1400 Eleventh Ave., Suite A
Helena, MT 59601
406-449-2821

Nebraska
Solid Waste Division
Dept. of Environmental Control
State House Station
P.O. Box 94877
Lincoln, NE 68509
402-471-2186

Nevada
Solid Waste Management
Div. of Environmental Protection
Department of Conservation
and Natural Resources
Capital Complex
Capitol City, NV 89710
702-885-4670

New Hampshire
Bureau of Solid Waste
Dept. of Health and Welfare
State Laboratory Building
Hazen Drive
Concord, NH 03301
603-271-4610

New Jersey
Solid Waste Administration
Div. of Environmental Quality
P.O. Box CNO27
Trenton, NJ 08625
609-292-9120

New Mexico
Solid and Hazardous Waste Management Programs
Health and Environment Dept.
P.O. Box 968
Crown Building
Santa Fe, NM 87503
505-827-5271 Ext. 282

New York
Division of Solid Waste Mgmt.
Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233
518-457-6603

North Carolina
Solid and Hazardous Waste Management Branch
Division of Health Services
Department of Human Resources
P.O. Box 2091
Raleigh, NC 27602
919-733-2178

North Dakota
Division of Environmental Waste Management & Research
Department of Health
1200 Missouri Avenue
Bismarck, ND 58505
701-224-2382

Ohio
Office of Land Pollution Control
Environmental Protection Agency
P.O. Box 1049
Columbus, OH 43216
614-466-8934

Oklahoma
Industrial & Solid Waste Service
Department of Health
P.O. Box 53551
Oklahoma City, OK 73152
405-271-5338

Oregon
Solid Waste Management Division
Dept. of Environmental Quality
P.O. Box 1760
Portland, OR 97207
503-299-5913

Pennsylvania
Bureau of Solid Waste Management
Dept. of Environmental Resources
P.O. Box 2063
Harrisburg, PA 17120
717-787-9870

Puerto Rico
Environmental Quality Board
Office of the Governor
P.O. Box 11488
Santurce, PR 00910
809-725-2062, Ext. 229

Rhode Island
Solid Waste Management Program
Dept. of Environmental Mgmt.
204 Health Building
Davis Street
Providence, RI 02908
401-277-2808

Rhode Island Solid Waste Corp.
39 Pike Street
Providence, RI 02903
401-831-4440

South Carolina
Solid Waste Management Division
Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201
803-758-5681

South Dakota
Air Quality and Solid Waste Programs
Department of Health
Carnegie Library Building
Pierre, SD 57501
605-773-3329

Tennessee
Division of Solid Waste Mgmt.
Bureau of Environmental Services
Department of Public Health
Capitol Hill Bldg., Suite 326
Nashville, TN 37219
615-741-3424

Texas
Division of Solid Waste Mgmt.
Texas Department of Health
1100 West 49th Street
Austin, TX 78756
512-458-7271

Industrial Solid Waste Unit
Department of Water Resources
P.O. Box 13087 Capital Station
Austin, TX 78711
512-475-2041

Utah
Bureau of Solid Waste Mgmt.
State Division of Health
P.O. Box 2500
Salt Lake City, UT 84110
801-533-4145

Vermont
Air and Solid Waste Programs
Agency of Environmental Conservation
State Office Building
Montpelier, VT 05602
802-828-3395

Virgin Islands
Solid Waste Planning Office
Department of Public Works
Government of the Virgin Islands
Charolotte Amalie
St. Thomas, VI 00801
809-774-7880

Virginia
Bureau of Solid and Hazardous Waste Management
Department of Health
109 Governor Street
Richmond, VA 23219
804-786-5271

Washington
Solid Waste Management Div.
Department of Ecology
Olympia, WA 98504
206-753-6883

West Virginia
Solid Waste Division
Department of Health
1800 Washington Street, E
Charleston, WV 25305
304-348-2987

Wisconsin
Bureau of Solid Waste Management
Department of Natural Resources
Box 7921
Madison, WI 53707
608-266-1327

Wyoming
Solid Waste Management Program
Dept. of Environmental Quality
Hathaway Building
Cheyenne, WY 82002
307-777-7752

Other Publications

Bottles and Cans, Using Them Again. McPhee, Gribble, Puffin Books, 1977. (Viking Press, New York.) A colorful, well-illustrated booklet that contains many interesting activities involving the reuse of materials to make craft projects.

Don't Waste Waste. Environmental Action Coalition, 1976. Curriculum for grade levels 4-6 includes bibliography and list of additional resources.

Eco-News. Environmental Action Coalition. A monthly environmental newsletter for young people.

Environmental Exchange... a Beginning. U.S. EPA, rev. ed. 1980. Office of Public Awareness. Curriculum for grades K-12.

Garbage Reincarnation. Sonoma County Community Recycling Center. $5.95. Instruction manual for grades K-6.

Importance of Being a Garbologist. Group for Recycling in Pennsylvania, rev. ed. 1979. Intended for grades 3-6.

Let's Dump the Dump. Channing L. Bete Co., Greenfield, Mass., rev. ed. 1979. $.75 each, $.50 per copy in order of 25-99, plus shipping. Cartoon presentation explaining what is improper about dumps and suggesting alternatives.

Let's Go to a Recycling Center. G.P. Putnam's Sons, New York. 1977.

Recycling. An educational reprint from Ranger Rick's Nature Magazine. National Wildlife Federation, November 1971. Intended for grades 3-6.

Recycling and the Consumer. U.S. EPA, 1974. Office of Solid Waste order no. SW-117.1. Poster-size flyer describes what is and is not recycled, barriers to recycling, approaches to municipal recycling, trends, and what the consumer can do.

Recyclopedia. Houghton Mifflin Co., Boston, Mass., 1976. $3.95 paper, $7.95 hardcover. Developed at the Boston Children's Museum. Includes chapter on how to make games, science equipment, and crafts from recycled materials.

Resource Recovery and You. Channing L. Bete Co., Greenfield, Mass., rev. ed. 1978. $.75 each $.50 per copy in order of 25-99 copies, plus shipping. A cartoon presentation of facts about the use, reuse, reprocessing, and recycling of materials.

There Lived a Wicked Dragon. U.S. EPA, 1973. U.S. Government Printing Office order no. 055-002-00106-8. $1.20 each, $27.50 for packet of 100. Coloring/story book for grades K-3.

Toys: Fun in the Making. U.S. Dept of HEW, rev. ed. 1979. U.S. Government Printing Office order no. OHD-79-30031. Instructs children how to make toys out of common throwaway items, such as toilet paper rolls. Intended for preschool-6.

Use It Again Sam. U.S. EPA, 1978. Office of Solid Waste order no. SW-616. Four-page pamphlet describes operation of Federal government's office-paper recycling program. (Also available: bumper sticker, order no. SW-414; and poster)

Waste Alert! A Citizen's Introduction to Public Participation in Waste Management. U.S. EPA, 1979. Office of Solid Waste order number SW-800. A 32-page pamphlet giving an overview of the nation's solid waste problem and the various ways in which the public can and should become involved in finding solutions.

Waste Not, Want Not. U.S. EPA, 1972. U.S. Government Printing Office order no. 055-002-00094-1, $.35 each, $4.50 per 100. Small poster deals with basic conservation issues from putting as little as possible into the garbage can to supporting community recycling programs.

What You Can Do To Recycle More Paper. U.S. EPA, 1975. Office of Solid Waste order no. SW-446. Twelve-page pamphlet discusses the recycling options of consumers, householders, citizens, students, teachers, and employees.

A World Fit for Chipmunks and Other Living Things. U.S. EPA Region VII, rev. ed. 1977. Coloring book or recycling litter, intended for grades K-3.

INFORMATION SOURCES

Environmental Action Coalition
156 Fifth Avenue
New York, NY 10010

Group for Recycling
in Pennsylvania
P.O. Box 7391
Pittsburgh, PA 15213

National Wildlife Federation
Educational Servicing
1412 16th Street, NW.
Washington DC 20036

Sonoma County Community
Recycling Center
P.O. Box 1375
Santa Rosa, CA 95403

U.S. EPA (A-107)
Office of Public Affairs
Washington DC 20460

U.S. EPA (WH-562)
Office of Solid Waste
Washington, DC 20460

U.S. EPA Region VII
Information Center Publications
324 E 11th Street
Kansas City, MO 64106

U.S. Government Printing Office
Superintendent of Documents
Washington DC 20402

PUZZLE ANSWERS

Down	Across
1. metal	2. earth
3. rust	5. oil
4. home	6. rats
7. tires	8. litter
9. tree	11. energy
10. rags	

µσ 1844
SW-801